PATENT SPECIFICATION (11) 1 568 220

1 568 220

(21) Application No. 52314/76 (22) Filed 15 Dec. 1976 (19)
(31) Convention Application No. 7 538 789 (32) Filed 18 Dec. 1975 in
(33) France (FR)
(44) Complete Specification published 29 May 1980
(51) INT. CL.³ A21D 15/04
(52) Index at acceptance
A2D 2E1 2F 3BX
B8C 40A4 F12

(54) METHOD & APPARATUS FOR THE PRESERVATION OF FOODSTUFFS

(71) I, GERARD JOULIN, a French citizen residing at 7, Avenue d'Alligre 78400-CHATOU, France, do hereby declare the invention for which I pray that a patent may be granted to me, and the method by which it is to be formed to be particularly described in the following statement: —

The present invention relates to a method and apparatus for the packing and long-life preservation of food products, more particularly bread or the like.

According to the invention there is provided a method for the sterile preservation of food products packed hermetically and substantially without oxygen, according to which a sheath is formed on a shaping device from a film whose two longitudinal edges are heat-sealed, the tubular sheath being moved from the shaping device to a transverse sealing device intended to form bags, each bag containing a given quantity of the food product, this product being introduced, in successive quantities, into said sheath at the shaping device and moving in the sheath synchronously with the latter to the sealing device, wherein at least a partial vacuum is created in the zone preceding the transverse sealing device, the product enclosed immediately thereafter in the bag formed by the transverse sealing device thus being partly evacuated and having the water vapour removed, and wherein the packages hermetically closed under partial vacuum are then conveyed into a chamber provided with heating means and are subjected to a heat treatment for sterilising the products, the degasification and removal of the water vapour to which the products were previously subjected, thus limiting the internal pressure within the sealed packages.

According to the invention there is provided an apparatus for carrying out the method mentioned above, of the type comprising means for forming a continuous tubular sheath from a film supplied from a reel and passing on to a shaping device of known type, the sheath being associated with members allowing its advance movement from the shaping device as far as a transverse sealing device intended to close and form the individual bags, the apparatus further comprising means for supplying food products to be packaged introduced into the sheath at the shaping device, said apparatus comprising a pipette penetrating the sheath, at the shaping device, in the zone immediately preceding the transverse sealing device, said pipette being connected to a vacuum-creating means enabling the gas located in the sheath immediately upstream of the sealing members to be removed, by creating inside the sheath a partial vacuum immediately in front of the sealing members, the products contained in the bag at the moment of its closure by transverse sealing thus being placed under reduced pressure or under partial vacuum at the moment when they are enclosed in the sealed bag, the apparatus further comprising a tunnel furnace located downstream of the transverse sealing device, the tunnel furnace having the chain of the hermetically packaged products continuously passing therethrough, the furnace being adapted to provide a heat treatment of the packaged products in order to sterilise same.

One embodiment of the invention will be described by way of example only with reference to the accompanying illustrative drawings, in which:

Figure 1 shows a side elevational view of a packaging apparatus according to the invention;

Figure 2 shows a detailed view in side elevation of the packaging apparatus according to the invention of Figure 1;

Figure 3 shows the same apparatus as in Figure 2 at a later phase of the operation;

Figure 4 shows a perspective detailed view of the packaging apparatus and more particularly the evacuation and transverse sealing zone;

Figure 5 shows a detailed view of the product packaged by the packaging apparatus of Figure 1; and

Figure 6 shows a partial view of the

pipette for evacuation and reinjection of neutral gas of the packaging apparatus of Figure 1.

Referring now to the drawings, Figures 1 to 4 show the apparatus according to the invention which comprises, in manner known per se, a shaping device 1 on to which passes a continuous film 2 of heat-sealable synthetic material supplied from a reel 3. This film, after passage on the shaping device, forms a tubular sheath 4 which is continuously conveyed from the shaping device 1 to a transverse sealing device 5. The edges of the sheath which are joined after passage on the shaping device 1 are sealed by passage over a lower sealing bar 6 of known type. The interior of the sheath, between the shaping device 1 and the sealing device 5 extends over a fairly considerable length in order to be sufficiently tight to place the product under vacuum at the transverse sealing device 5.

The product is in the present case constituted by piles of slices of bread and these piles 7, 8, 9, 10 are formed from transverse supply chambers 11, 11′ which are themselves associated upstream, in known manner, with cutting devices receiving the loaves whole and supplying said chambers with slices which may be automatically distributed in successive, predetermined piles suitably spaced out on the conveyor belt 12; this latter conveys the piles at regular intervals from the supply chambers to the interior of the sheath 4 by passing through the opening formed by the inlet of the shaping device 1. Under these conditions, the piles of bread slices 7, 8, 9, 10 move in synchronism with the sheath from the shaping device 1 to the transverse sealing device 5.

In accordance with the essential feature of the invention, there is provided inside the sheath a pipette 13 terminating at its end by a nozzle 14 which is preferably flared and flattened, located inside the sheath in the zone immediately preceding the transverse sealing device 5 (which will be described hereinafter).

The pipette 13 leaves the sheath through the opening in the shaping device and it terminates in a three-way valve 16 connected on the one hand to a pipe 15 leading to a source of vacuum and on the other hand to a second pipe 15′ leading to a source of neutral gas such as nitrogen.

The transverse sealing device is shown in detail in Figure 4. It is composed of two conveyor belts, an upper one 17 and lower one 18, held and driven by rolls 19, 19′, 20, 20′, said conveyors being constituted by a belt coated with a non-adherent material, for example a synthetic foam: each of the upper and lower conveyors 17 and 18 comprsies transverse heat-sealing bars 21, 22, 23 and 24 and 21′, 22′, 23′ and 24′. These bars are disposed transversely and those of one conveyor are symmetrical with those of the other so that they are in register, as may be seen for bars 23, 23′ in Figure 3 and imprison there-between a transverse section of the sheath 4; these bars 23, 23′ consequently ensure the contact and heating, with a view to its heat-sealing, of the wall of the sheath and the two bars forming heat-sealing jaws stay with the sheath whilst said latter passes between the conveyor belts.

Under these conditions, the bars return at regular intervals into register at the inlet of the sealing device and they move towards one another until they imprison the transverse section of the wall of the sheath, ensuring the closure of this latter at regular intervals and thus shaping individual bags containing a determined quantity of product, i.e. in the present case two piles of bread slices.

The pipette 13, due to the three-way valve 16 being suitably manoeuvred, is placed successively in communication with a vacuum via pipe 15 and with the source of gas such as nitrogen 15′; the manoeuvre of the three-way valve is automatic, being controlled by a control relay of the electrical or pneumatic type so that the three-way valve is manoeuvred at regular periods corresponding to the movement of the transverse heat-sealing bars 21, 21′, 22, 22′, 23, 23′, 24, 24′ constituting the bag closing device.

In this way, during the greater part of a bag forming cycle, the pipette 13 is placed in communication via the three-way valve with the source of vacuum. Under these conditions, the zone of the sheath located immediately upstream of the sealing device, i.e. the zone beneath the flared nozzle 14 is placed under partial vacuum.

In fact, the successive piles of slices of bread located in the interior of the sheath between the sealing device 5 and the shaping device 1 substantially fill the transverse section of the sheath and thus constitute obstacles which are sufficient to oppose the immediate admission of air from the outside to compensate the vacuum. In this way, a partial vacuum is produced inside the sheath immediately before the closure zone, which partial vacuum is sufficient for the needs of the packaging. This phase of the cycle is illustrated more especially in Figure 2; in this phase, the nozzle 14 draws a large part of the air from the sheath thus degasifying the porous matter constituting the bread product contained therein and eliminating a large part of the atmospheric oxygen present in the cells of the product.

As is then seen in the subsequent phase shown in Figure 3, which corresponds to

the end of the bag forming cycle, jaws formed by the heat-sealing bars 21, 21' are ready to clamp the walls of the sheath together and to form the bag. At this stage, the three-way valve 16 places the pipette 13 in communication, for a limited period of time, with the source of nitrogen 15' and nitrogen is then reinjected in the sheath in the zone corresponding to the bag which is about to be closed; in these conditions, when the jaws or heat-sealing bars join together and close the bag, thus imprisoning the product, the interior of the bag has had a large part of the atmospheric oxygen removed therefrom and in counterpart it has received an injection of neutral gas such as nitrogen which will avoid any phenomenon of oxidation of the product during its preservation.

Subsequently, as may be seen in Figure 1, the individual bags which constitute a continuous chain are conveyed towards a tunnel furnace 25 which may operate by infrared rays or by high frequency pulses or by using these two means at the same time, in order to ensure the final sterilisation by heat treatment; the packaged product leaving the furnace is thus sterilised and enclosed in a tight package containing little or no oxygen and it may therefore be kept for a long time whilst maintaining an excellent quality of taste and resisting any microbial action, it in fact being protected from germs by the sealed and tight package. The degasification and evacuation at the moment of closure of the packet allow, during passage to the sterilisation (or pasteurisation) furnace, the emission of water vapour within the closed envelope without bursting; this water momentarily brought to the state of vapour may compensate the partial vacuum previously created without reaching the rupture pressure of the closed bag; the water then recondenses in the product and the partial vacuum is formed again; the interior of the bag remaining sterile.

Fig. 5 shows the individual package 27 when it has left the furnace, and containing beneath a sealed film the twin piles of five slices of bread each.

The device according to the invention has the considerable advantage of allowing a continuous and regular process forming an entirely automatic chain from the dispensing of the individual quantities onto the belt 12 at the supply chambers 11, 11' to the outlet of the sterilisation furnace 25.

All the operations are entirely automatic and without any manual intervention.

However, the device enables the problem of tightness, which is necessary for obtaining an evacuation of the products, to be solved. This tightness can be produced, when using the known conventional means, only by operating with discontinuous quantities or by step-by-step functioning, in order to allow the positioning of means producing tightness such as jaws clamping the evacuating or reinjecting pipe according to the previously known devices:

One advantage of the device according to the invention, contrary to the prior devices, is that it is possible to produce tightness by employing both the princpiles of evacuation and of reinjection of a neutral gas without using specific members producing tightness; this latter occurs in a particularly unexpected manner by the mass of products which is conveyed inside the sheath between the shaping device and the sealing zone and the phenomenon of vacuum is therefore essentially produced in the interior of the sheath immedaitely preceding the sealing by transverse closure members and this vacuum continues along the sheath from the transverse sealing zone to the shaping device so that, as the products are conveyed towards the zone of sealing, i.e. towards their final packaging, they are progressively degasified and brought under reduced pressure. This progressive evacuation is advantageous insofar as it avoids too abrupt a degasification or evacuation of the products which would risk affecting their physical structure.

It is specified that, although the invention has been described more especially in connection with its application to food products in solid form, and more particularly bread products, it may also be applied to any product to be packed under reduced pressure and possibly with reinjection of a neutral gas.

In particular, the device may be applied to conventional packaging machines in which the sheath formed on a shaping device is conveyed vertically downwardly as far as transverse sealing members; in this case, the products are conveyed inside the sheath, having been poured into this latter via a funnel penetrating inside the shaping device and opening into the interior of the sheath. In this case, the vertically disposed sheath extends from the shaping device as far as the level of the sealing members and it makes it possible to obtain, immediately upstream of these sealing members, a partial vacuum immediately preceding the closure of the bag, possibly associated with the introduction of a determined quantity of neutral gas into the product at the moment of formation and closure of the packing bag.

According to the development of Figure 6 which shows a partial view of the pipette for evacuation and reinjection of neutral gas, the tube constituted by the pipette penetrating over a certain length in the sheath is associated over at least a part of its

length with preferably sectioned obturating elements, intended to fill the lateral spaces on either side of the pipette between the upper wall of the sheath and the solid product conveyed inside said sheath; for example, in Figure 6, the central pipette 13 is associated with side fins 26, 26′ thus forming on their upper part a convex wall on which the upper face of the sheath easily slides, whilst their lower horizontal wall is flush with the upper level of the pile of slices of bread; the two fins 26, 26′ therefore fill the space which would otherwise exist between the face of the sheath 4 above the pipette 13 and the products; these obturation elements facilitate the evacuation of the products at the sealing zone, as has already been described.

The two fins 26, 26′ may be constituted by two separate side elements connected on each side of the central pipette 13; however, they may also be constituted by a single sectioned element through which the pipette 13, thus embedded within these sectioned elements, passes; the obturation members will advantageously be provided with an outer surface with low coefficient of friction for example, they may be made of moulded synthetic material, they could also optionally have an outer anti-adherent coating, for example in the form of ethylene polytetrafluoride (Teflon, a Registered Trade Mark) or any other resin known for its anti-adherent properties.

It is understood that the obturation means which are associated with the pipette may have any shape adapted to the particular section of the products to be packed; consequently the site of the obturation members facing the product need not be flat but may be complementary to that of the products conveyed inside the sheath; if for example the upper face of the products is convex, the fins 26, 26′ will curve downwardly at the sides so as to envelope the convex section of the product.

WHAT I CLAIM IS:—

1. A method for the sterile preservation of food products packed hermetically and substantially without oxygen, according to which a sheath is formed on a shaping device from a film whose two longitudinal edges are heat-sealed, the tubular sheath being moved from the shaping device to a transverse sealing device intended to form bags, each bag containing a given quantity of the food product, this product being introduced, in successive quantities, into said sheath at the shaping device and moving in the sheath synchronously with the latter to the sealing device, wherein at least a partial vacuum is created in the zone preceding the transverse sealing device, the product enclosed immediately thereafter in the bag formed by the transverse sealing device thus being partly evacuated and having the water vapour removed, and wherein the packages hermetically closed under partial vacuum are then conveyed into a chamber provided with heatnig means and are subjected to a heat treatment for sterilising the products, the degasification and removal of the water vapour to which the products were previously subjected thus limiting the internal pressure within the sealed packages.

2. A method as claimed in Claim 1, in which the evacuation is immediately followed by the reinjection of a neutral gas in order to maintain a reduced pressure within the product, this reinjection occurring immediately before the closure of the bag by the action of the transverse sealing members.

3. An apparatus for carrying out the method as claimed in Claim 1, of the type comprising means for forming a continuous tubular sheath from a film supplied from a reel and passing onto a shaping device of known type, the sheath being associated with members allowing its advance movement from the shaping device as far as a transverse sealing device intended to close and form the individual bags, the apparatus further comprising means for supplying food products to be packaged introduced into the sheath at the shaping device, said apparatus comprising a pipette penetrating the sheath, at the shaping device in the zone immediately preceding the transverse sealing device, said pipette being connected to vacuum-creating means enabling the gas located in the sheath immediately upstream of the sealing members to be removed, by creating inside the sheath a partial vacuum immediately in front of the sealing members, the products contained in the bag at the moment of its closure by transverse sealing thus being placed under reduced pressure or under partial vacuum at the moment when they are enclosed in the sealed bag, the apparatus further comprising a tunnel furnace located downstream of the transverse sealing device, the tunnel furnace having the chain of the hermetically packaged products continuously passing therethrough, the furnace being adapted to provide a heat treatment of the packaged products in order to sterilise same.

4. Apparatus as claimed in Claim 3, in which the transverse sealing members which form and close the bag containing the product to be packed by two front and rear welds made transversely in the tubular sheath are constituted by heat-sealing bars mounted transversely on two upper and lower conveyor belts, these conveyor belts moving synchronously and the heat-sealing bars being disposed symmetrically on the two conveyors so that the bar of one

conveyor comes into register with the twin bar of the other conveyor, the two bars clamping on the tubular sheath and moving along with the whole of the sheath following the movement of the conveyors, corresponding to a sufficient period of time to ensure the transverse heat-sealing of the portion of sheath imprisoned between the two transverse heat-sealing bars.

5. Apparatus as claimed in Claim 4, in which the two conveyors constitute at the same time the support of the heat-sealing bars and the means for advancing the sheath, the conveyor belts being suitably coated on their outer face coming into contact with the sheath, the displacement of the bars causing the sheath to move continuously.

6. Apparatus as claimed in any one of Claims 3 to 5, in which the evacuation pipette penetrating the sheath as far as the transverse sealing zone is connected via a three-way valve on the one hand to a source of a neutral gas such as nitrogen, the three-way valve being controlled by a control device ensuring the communication of the pipette successively with the source of vacuum and with the source of neutral gas during periods of time programmed as a function of the advance of the sheath and the formation of the individual bags by transverse sealing, the evacuation phase extending during the greater part of a cycle and being followed for a short duration by the communication of the pipette with the source of neutral gas with a view to injecting a limited quantity of neutral gas within the sheath during the limited period of time immediately preceding the closure of the bag by transverse sealing.

7. An apparatus as claimed in any one of Claims 3 to 6, which includes a conveyor belt for conveying and supplying the sheath with products to be packed, this belt being supplied from a plurality of supply chambers disposed at right angles thereto and adapted mechanically to deposit on the belt successive piles corresponding to individual quantities of the product to be packed.

8. An apparatus as claimed in any one of Claims 3 to 7, wherein the pipette penetrating inside the sheath from the inlet of the shaping device to the sealing zone is associated with means for obturating the space between the wall of the sheath sliding on the outer part of the pipette and the products conveyed inside the sheath, these obturation means extending over at least a part of the length of the pipette and being provided with such a section that one side (facing the product) is disposed parallel to the axis of movement of the product and being flush, with a slight clearance, with the top of the products.

9. An apparatus as claimed in any one of Claims 3 or 4, 7 or 8, in which the means for obturating the sheath from the shaping device as far as the sealing jaws are coated at least partially with an anti-adherent coating such as a coating based on fluorinated resin.

10. A method substantially as herein described with reference to the accompanying illustrative drawings.

11. An apparatus substantially as herein described with reference to the accompanying illustrative drawings.

URQUHART-DYKES & LORD,
11th Floor,
St. Martin's House,
140 Tottenham Court Road,
London W1P 0JN.
and
11th Floor,
Tower House,
Merrion Way,
Leeds LS2 8PB.
Chartered Patent Agents.

Printed for Her Majesty's Stationery Office by Burgess & Son (Abingdon), Ltd.—1980.
Published at The Patent Office, 25 Southampton Buildings, London, WC2A 1AY
from which copies may be obtained.

1568220 COMPLETE SPECIFICATION

4 SHEETS *This drawing is a reproduction of the Original on a reduced scale*

Sheet 1

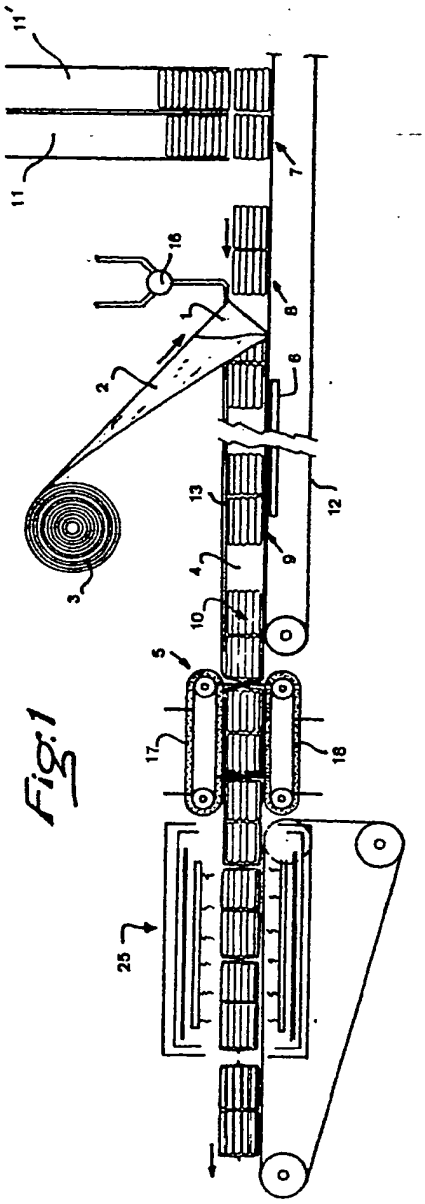

Fig.1

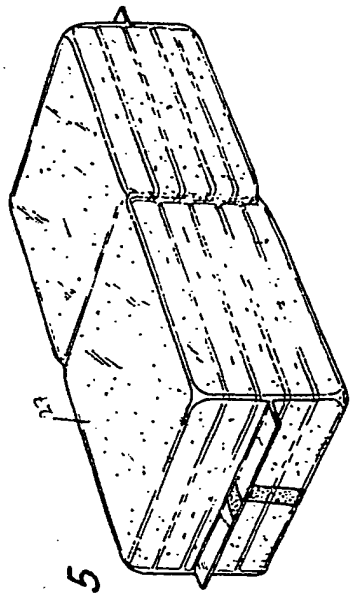

Fig.5

1568220 COMPLETE SPECIFICATION
4 SHEETS This drawing is a reproduction of the Original on a reduced scale
Sheet 2

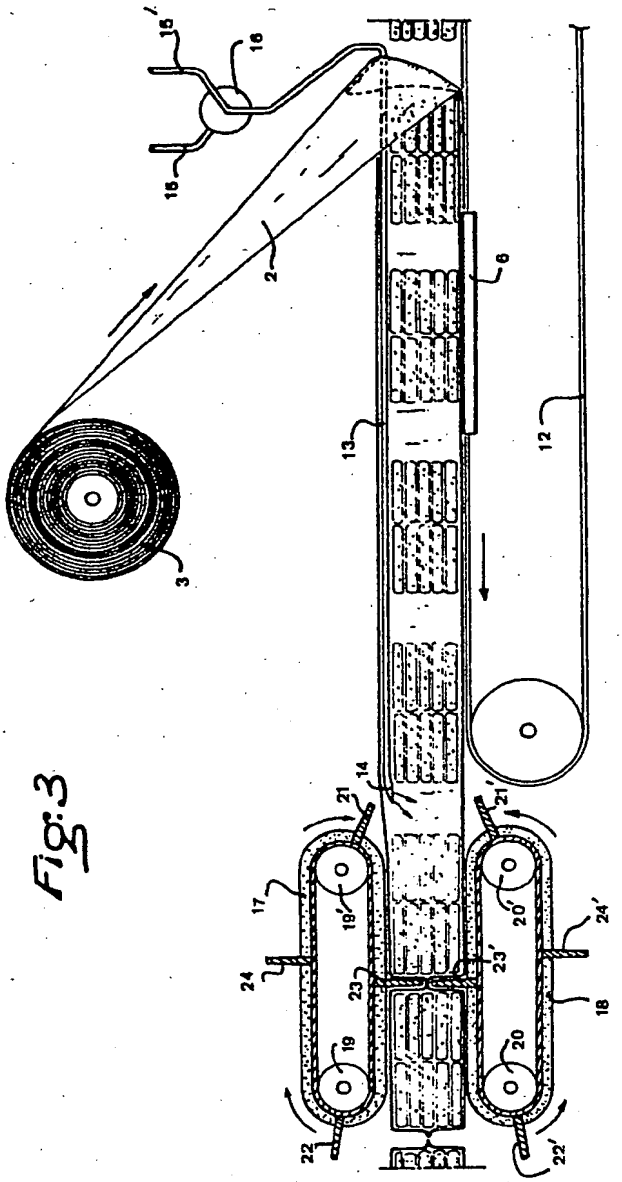

Fig.3

1568220 COMPLETE SPECIFICATION

4 SHEETS *This drawing is a reproduction of the Original on a reduced scale*

Sheet 3

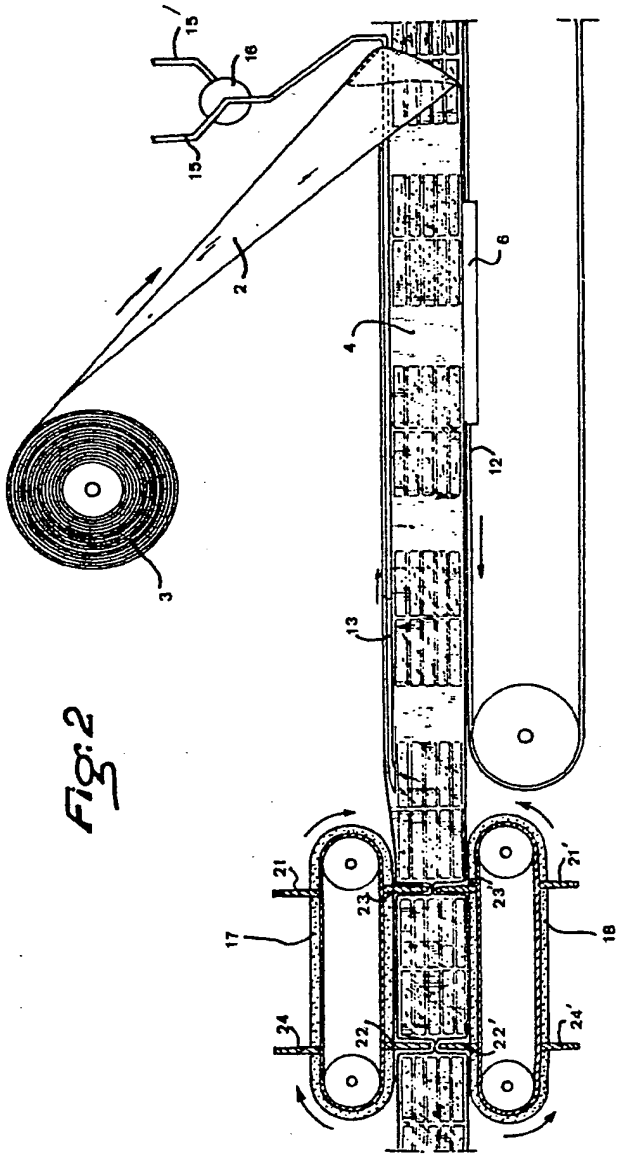

Fig. 2

1568220 COMPLETE SPECIFICATION

4 SHEETS *This drawing is a reproduction of the Original on a reduced scale*

Sheet 4

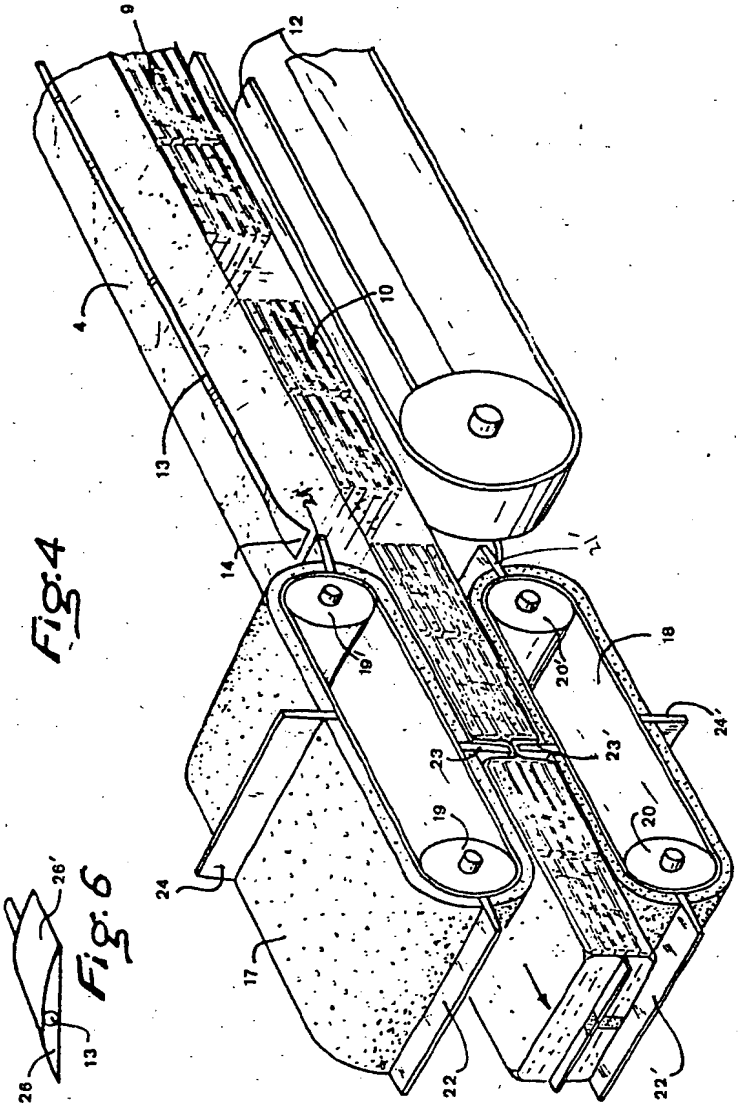

Fig. 4

Fig. 6

THIS PAGE BLANK (USPTO)